CLAIMS

1. An optical memory reproduction apparatus which reproduces data from an optical memory medium (2) comprising: cores (21) each of which constitutes a planar optical waveguide, and clads (22) which sandwich each core (21), and having: a data image (203) in which data is recorded as a scattering factor; and a pair of positioning marks (201, 202) which are respectively scattering factors required for positioning, at an interface between a core (21) and a clad (22) or in the core (21),

the optical memory reproduction apparatus comprising:

a light source (11) which emits: a read light (103) which is caused to enter the core (21) from an end surface of the optical memory medium (2), travels while spreading in the core (21), and is coupled with the core (21) to form an optical coupling area in such a manner that the optical coupling area includes the data image (203); and a pair of positioning lights (101, 102) which are caused to enter the core (21) with offsets with respect to the read light (103) in opposite directions along a thickness direction of the core (21), travels in the core (21), and are coupled with the core (21) to form optical coupling areas

in such a manner that the optical coupling areas include the pair of positioning marks (201, 202);

a data reproduction light imaging element (133) which receives a data reproduction light (1031) generated due to scattering and interference of the read light (103) in the data image (203);

a data reproducing unit (14) which reproduces data imaged by the data reproduction light imaging element (133);

a positioning mark light receiving element (131, 132) which receives a pair of positioning mark lights (1011, 1021) generated due to scattering and interference of the pair of positioning lights (101, 102) in the pair of positioning marks (201, 202); and

a light source position control unit (16) which controls an incidence position of the read light (103) with respect to the core (21) in the thickness direction thereof based on intensities of the pair of positioning mark lights (1011, 1021) detected by the positioning mark light receiving element (131, 132).

2. The optical memory reproduction apparatus according to claim 1, wherein a condensing pattern of each positioning light (101, 102) is a dot-like shape or a circular shape.

3. The optical memory reproduction apparatus according to claim 1, wherein the light source (11) alternately emits the pair of positioning lights (101, 102) in a time-sharing manner.

4. An optical memory reproduction apparatus which reproduces data from an optical memory medium (2) comprising: cores (21) each of which constitutes a planar optical waveguide; and clads (22) which sandwich each core (21), and having: a pair of data images (2011, 2012) in which the data is recorded as a scattering factor; and a pair of positioning marks (201, 202) which are respectively scattering factors required for positioning, at an interface between a core (21) and a clad (22) or in the core (21),

the optical memory reproduction apparatus comprising:

a light source (11) which emits a pair of positioning/read lights (101, 102) which are caused to enter the core (21) from an end surface of the optical memory medium (2) at different positions in a thickness direction of the core (21), travel while spreading in the core (21), and are coupled with the core (21) to form optical coupling areas in such a manner that the optical coupling areas respectively include the pair of data images (2011, 2012) and the pair of positioning marks (201, 202);

a data reproduction light imaging element (133) which receives a pair of data reproduction lights (1012, 1022) generated due to scattering and interference of the pair of positioning/read lights (101, 102) in the pair of data images (2011, 2012);

a data reproducing unit (14) which reproduces data imaged by the data reproduction light imaging element (133);

a positioning mark light receiving element (131, 132) which receives a pair of positioning mark lights (1011, 1021) generated due to scattering and interference of the pair of positioning/read lights (101, 102) in the pair of positioning marks (201, 202); and

a light source position control unit (16) which controls incidence positions of the pair of positioning/read lights (101, 102) with respect to the core (21) in the thickness direction thereof based on intensities of the pair of positioning mark lights (1011, 1021) detected by the positioning mark light receiving element (131, 132).

5. The optical memory reproduction apparatus according to claim 4, wherein a condensing pattern of each positioning/read light (101, 102) is a dot-like shape or a circular shape.

6. The optical memory reproduction apparatus

according to claim 4, wherein the light source (11) alternately emits the pair of positioning/read lights (101, 102) in a time-sharing manner.

7. An optical memory reproduction apparatus which reproduces data from an optical memory medium (2) comprising: cores (21) each of which constitutes a planar optical waveguide; and clads (22) which sandwich each core (21), and having: a data image (203) in which data is recorded as a scattering factor; and a pair of positioning marks (201, 202) which are respectively scattering factors required for positioning, at an interface between a core (21) and a clad (22) or in the core (21),

the optical memory reproduction apparatus comprising:

a light source (11) which emits a positioning/read light (104) which has a elliptic or rectangular cross section, is caused to enter the core (21) from an end surface of the optical memory medium (2) at an angle by which a longitudinal direction of the cross section is not parallel with the interface, travels while spreading in the core (21), and is coupled with the core (21) to form an optical coupling area in such a manner that a central portion of the optical coupling area includes the data image (203) and

both end portions of the optical coupling area includes the pair of positioning marks (201, 202);

a data reproduction light imaging element (133) which receives a data reproduction light (1031) generated due to scattering and interference of the positioning/read light (104) in the data image (203);

a data reproducing unit (14) which reproduces data imaged by the data reproduction light imaging element (133);

a positioning mark light receiving element (131, 132) which receives a pair of positioning mark lights (1011, 1021) generated due to scattering and interference of the positioning/read light (104) in the pair of positioning marks (201, 202); and

a light source position control unit (16) which controls an incidence position of the positioning/read light (104) with respect to the core (21) in a thickness direction thereof based on intensities of the pair of positioning mark lights (1011, 1021) detected by the positioning mark light receiving element (131, 132).

8. The optical memory reproduction apparatus according to claim 1, claim 4 or claim 7, wherein the light source position control unit (16) compares the intensities of the pair of positioning

mark lights (1011, 1021) with each other, determines a movement direction of the light emitted from the light source (11) and moves the light in accordance with a result of the comparison, and controls the incidence position of the light emitted from the light source (11) in such a manner that an intensity difference becomes zero.

9. An incidence positioning method for a read light (103) in an optical memory reproduction apparatus applying the read light (103) which travels while spreading to a core (21) portion on an end surface of an optical memory medium (2) comprising cores (21) each of which constitutes a planar optical waveguide and clads (22) which sandwich each core (21) and having a data image (203) in which data is recorded as a scattering factor and a pair of positioning marks (201, 202) which are respectively scattering factors required for positioning, at an interface between a core (21) and a clad (22) or in the core (21), the read light (103) being coupled with the core (21) to form an optical coupling area in such a manner that the optical coupling area includes the data image (203), the optical memory reproduction apparatus reproducing data based on a data reproduction light (1031) generated due to scattering and interference of the read light in the data image (203),

the incidence positioning method comprising:

causing a pair of positioning lights (101, 102) to enter the end surface of the optical memory medium (2) in such a manner that the pair of positioning lights have offsets with respect to the read light (103) in opposite directions along a thickness direction of the core (21);

forming an optical coupling area by coupling of the pair of positioning lights (101, 102) which have entered the core (21) with the core (21) in such a manner that the optical coupling area includes the pair of positioning marks (201, 202);

receiving by a positioning mark light receiving element (131, 132) a pair of positioning mark lights (1011, 1021) generated due to scattering and interference of the pair of positioning lights (101, 102) in the pair of positioning marks (201, 202); and

controlling an incidence position of the read light (103) emitted from the light source (11) with respect to the core (21) in a thickness direction thereof based on intensities of the pair of positioning mark lights (1011, 1021) which have entered the positioning mark light receiving element (131, 132).

10. The incidence positioning method according

to claim 9, wherein a condensing pattern of each positioning light (101, 102) is a dot-like shape or a circular shape.

11. The incidence positioning method according to claim 9, wherein the pair of positioning lights (101, 102) are alternately emitted in a time-sharing manner.

12. An incidence positioning method for a pair of positioning/read lights (101, 102) in an optical memory reproduction apparatus applying the pair of positioning/read lights (101, 102) which travel while spreading to a core (21) portion on an end surface of an optical memory medium (2) comprising cores (21) each of which constitutes a planar optical waveguide and clads (22) which sandwich each core (21) and having a pair of data images (2011, 2012) in which data is recorded as a scattering factor and a pair of positioning marks (201, 202) which are respectively scattering factors required for positioning, at an interface between a core (21) and a clad (22) or in the core (21), the pair of positioning/read lights (101, 102) being coupled with the core (21) to form optical coupling areas in such a manner that the optical coupling areas include the pair of data images (2011, 2012), the optical memory

reproduction apparatus reproducing data based on a pair of data reproduction lights (1012, 1022) generated due to scattering and interference of the pair of positioning/read lights in the pair of data images (2011, 2012),

the incidence positioning method comprising:

forming optical coupling areas by coupling the pair of positioning/read lights (101, 102) which have entered the core (21) with the core (21) in such a manner that the optical coupling areas include the pair of positioning marks (201, 202);

receiving by positioning mark light receiving element (131, 132) a pair of positioning mark lights (1011, 1021) generated by scattering and interference of the pair of positioning/read lights (101, 102) in the pair of positioning marks (201, 202); and

controlling incidence positions of the pair of positioning/read lights (101, 102) emitted from the light source (11) with respect to the core (21) in a thickness direction thereof based on intensities of the pair of positioning mark lights (1011, 1021) which have entered the positioning mark light receiving element (131, 132).

13. The incidence positioning method according to claim 12, wherein a condensing pattern of each

positioning/read light (101, 102) is a dot-like shape or a circular shape.

14. The incidence positioning method according to claim 12, wherein the pair of positioning/read lights (101, 102) are alternately emitted in a time-sharing manner.

15. An incidence positioning method for a positioning/read light (104) in an optical memory reproduction apparatus applying the positioning/read light (104) which has an elliptic or rectangular cross section and travels while spreading to a core (21) portion on an end surface of an optical memory medium (2) at an angle by which a longitudinal direction of the cross section is not parallel with an interface between a core (21) and a clad (22), the optical memory medium (2) comprising cores (21) each of which constitutes a planar optical waveguide and clads (22) which sandwich each core (21) and having a data image (203) in which data is recorded as a scattering factor and a pair of positioning marks (201, 202) which are respectively scattering factors required for positioning at the interface between the core (21) and the clad (22) or in the core (21), the positioning/read light (104) being coupled with the core (21) to form an optical coupling area in such

a manner that the optical coupling area includes the data image (203), the optical memory reproduction apparatus reproducing data based on a data reproduction light (1031) generated due to scattering and interference of the positioning/read light in the data image (203),

the incidence positioning method comprising:

forming the optical coupling area by coupling the positioning/read light (104) which has entered the core (21) with the core (21) in such a manner that both end portions of the optical coupling area include the pair of positioning marks (201, 202);

receiving by a positioning mark light receiving element (131, 132) a pair of positioning mark lights (1011, 1021) generated due to scattering and interference of the positioning/read light (104) in the pair of positioning marks (201, 202); and

controlling an incidence position of the positioning/read light (104) emitted from the light source (11) with respect to the core (21) in a thickness direction thereof based on intensities of the pair of positioning mark lights (1011, 1021) which have entered the positioning mark light receiving element (131, 132).

16. The incidence positioning method according

to claim 9, claim 12 or claim 15, wherein the step of controlling a position of the light source (11) compares the intensities of the pair of positioning mark lights (1011, 1021) with each other, determines a movement direction of the light emitted from the light source (11) and moves the light in accordance with a result of the comparison, and controls the incidence position of the light emitted from the light source (11) in such a manner that an intensity difference becomes zero.